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Structural, Phase Development and Magnetic Behavior of Polycrystalline Yttrium Iron Garnet

Rabaah Syahidah Azis[1, 2,*], Nuraine Mariana Mohd bShahrani[2], Jumiah Hassan[1, 2], Zulkifly Abbas[1] and Norlaily Mohd Saiden[1]

[1]Physics Department, Faculty of Science,Universiti Putra Malaysia,43400 Serdang, Selangor, Malaysia
[2]Materials Synthesis and Characterisation Laboratory, Institute of Advanced Technology (ITMA),Universiti Putra Malaysia,43400 Serdang, Selangor, Malaysia

***Corresponding author's e-mail: rabaah@upm.edu.my

Abstract. The interest of this work is to investigate the influence of sintering temperatures on the structural, phase development and the magnetic properties of polycrystalline yttrium iron garnet ($Y_3Fe_5O_{12}$, YIG). The samples were prepared using α-Fe_2O_3 and Y_2O_3 as starting powders by employing a high-energy ball milling (HEBM) technique using a SPEX8000D mill and milled for 9 h. The samples were sintered for 9 h from 500 °C to 1400 °C with increments of 100 °C. Particle size analysis was carried out using a Transmission electron microscope (TEM). The phase development and crystallography study were determined using X-ray Diffractometer (XRD). Field emission scanning electron microscope (FeSEM) was used to study the morphology and microstructural evolutions of YIG. Parallel evolution on magnetic permeability components and Curie temperature were characterized by impedance analyzer. Magnetization-hysteresis (*M-H*) curve parameters were obtained from a vibrating sample magnetometer (VSM). The change in particle size from nano to micro was also studied with respect to sintering temperatures, structural, phase development and magnetic properties.

Keywords: $Y_3Fe_5O_{12}$, HEBM, XRD, FESEM, VSM